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मानक

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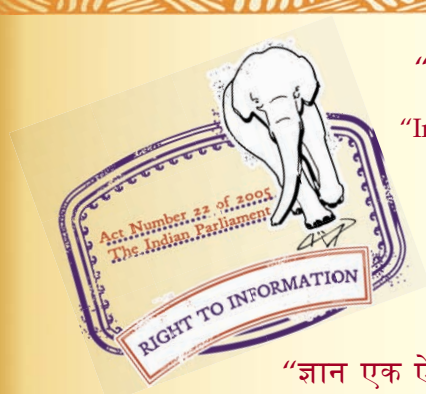
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“Step Out From the Old to the New”

IS 7587-7 (2000): Cage Suspension Gear for Winding in Mines, Part 7: Safety Detaching Hook (4 Plate Type) 120, 150 and 200 kN Capacity [MED 8: Mining Techniques and Equipment]



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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक
माइन केज निलंबन गियर में कुंडलन — विशिष्टि
भाग 7 सुरक्षा वियोजक हुक
(4 प्लेट टाइप) 120, 150 और 200 कि. न्यूटन क्षमता वाले

Indian Standard
**CAGE SUSPENSION GEAR FOR WINDING
IN MINES — SPECIFICATION**
PART 7 SAFETY DETACHING HOOK
(4 PLATE TYPE) 120, 150 AND 200 kN CAPACITY

ICS 73.020

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Part 7) was adopted by the Bureau of Indian Standards, after the draft finalized by the Mining Techniques and Equipment Sectional Committee had been approved by the Mechanical Engineering Division Council.

Safety hook is a component of cage suspension gear and this device is located between the end of a winding rope and a conveyance so that in the event of an over wind, an ascending drum wound conveyance is detached from the rope and held in the detaching plate fixed in the head frame.

This Indian Standard IS 7587 (Part 7) is one of the series of standards on the cage suspension gear. The other parts of this standards are:

- Part 1 General requirements
- Part 2 Cappelles
- Part 3 Shackles and pins
- Part 4 Bridle chains
- Part 5 Equalizing plates
- Part 6 Safety detaching hooks (4 plates type)
- Part 8 Clivy hook suspension arrangements

Initially, the standard on safety hooks for use in mines was published as IS 3970 : 1967 'Safety detaching hooks used in mines'. With the experience gained over the years in the use of safety hooks, a necessity was felt for incorporating the dimensional details of the hooks and corresponding detaching plates. Accordingly the revised standards specify the dimensional details. In addition, a detaching test has been incorporated to test the proper functioning of the safety hook in the event of over wind.

Part 6 of the standard covers the detaching hooks up to 100 kN safe working load. This Standard Part 7 covers the detaching hooks having safe working load over 100 kN and up to 200 kN. At the time of publication of Part 7, Part 6 will be suitably modified to indicate the scope, title and range of safety hooks covered in Part 6.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard***CAGE SUSPENSION GEAR FOR WINDING
IN MINES—SPECIFICATION****PART 7 SAFETY DETACHING HOOK
(4 PLATE TYPE) 120, 150 AND 200 kN CAPACITY****1 SCOPE**

1.1 This standard covers the requirements of safety detaching hooks (4 plate type) 120 kN, 150 kN and 200 kN safe working load, used in suspension gear for winding in mines.

1.2 It also covers requirements of detaching plate, the top and bottom chase blocks, line plates, lifting shackles and pins with detaching hooks.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

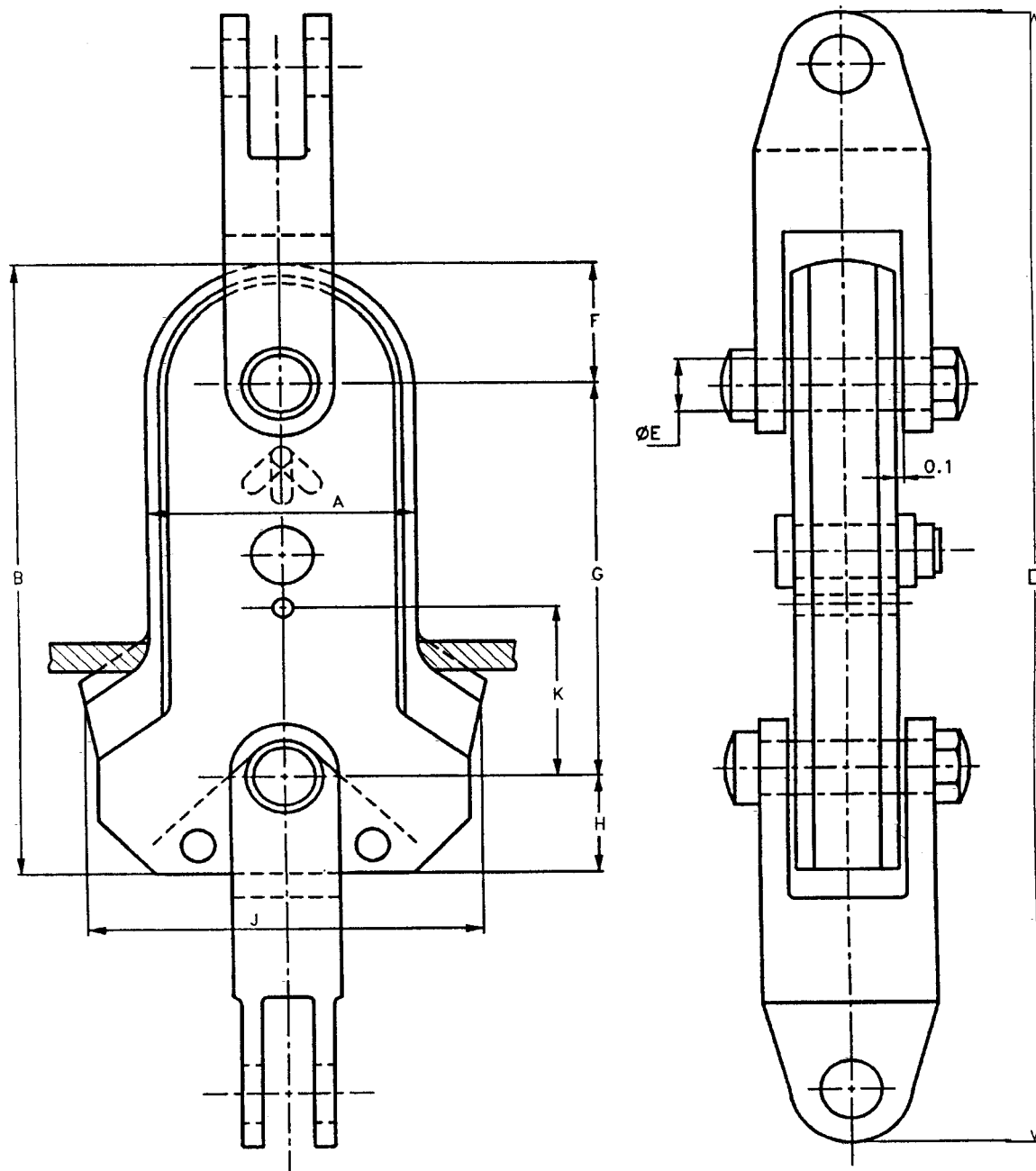
<i>IS No.</i>	<i>Title</i>
191(Parts 1 to 10) : 1980	Copper (<i>third revision</i>)
1148 : 1982	Hot rolled steel rivet bars (up to 40 mm dia) for structural purposes (<i>third revision</i>)
3073 : 1967	Assessment of surface roughness
3703 : 1980	Code of practice for magnetic particle flaw detection (<i>first revision</i>)
7587	Cage suspension gear for winding in mines:
(Part 1) : 1975	Part 1 General requirements
(Part 6) : 1984	Part 6 Safety detaching hooks (4 plate type).

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 7587 (Part 6) shall apply.

4 DIMENSIONS

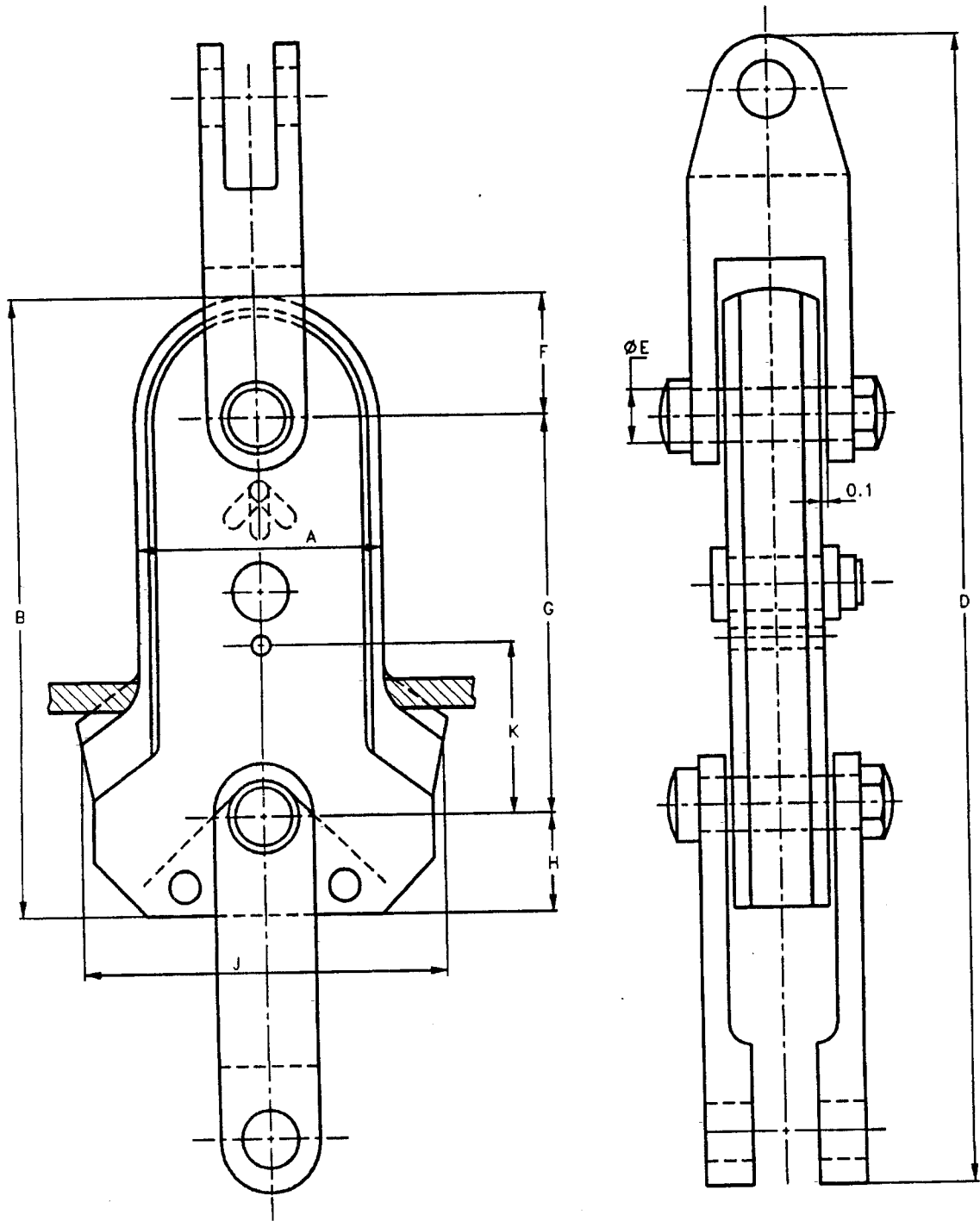
4.1 Safety Hook with Top and Bottom Chase Block



All dimensions in millimetres.

Safe Working Load	Hook Size (A)	B	D	ϕE	F	G	H	J	K
kN									
120	254	708	1 489	60	127	480	101.5	395	185
150	254	731	1 557	75	136.5	490	105	395	195
200	305	860	1 789	80	152.5	593	115	490	235

4.2 Safety Hook with Top Chase Block and Bottom Link Plates

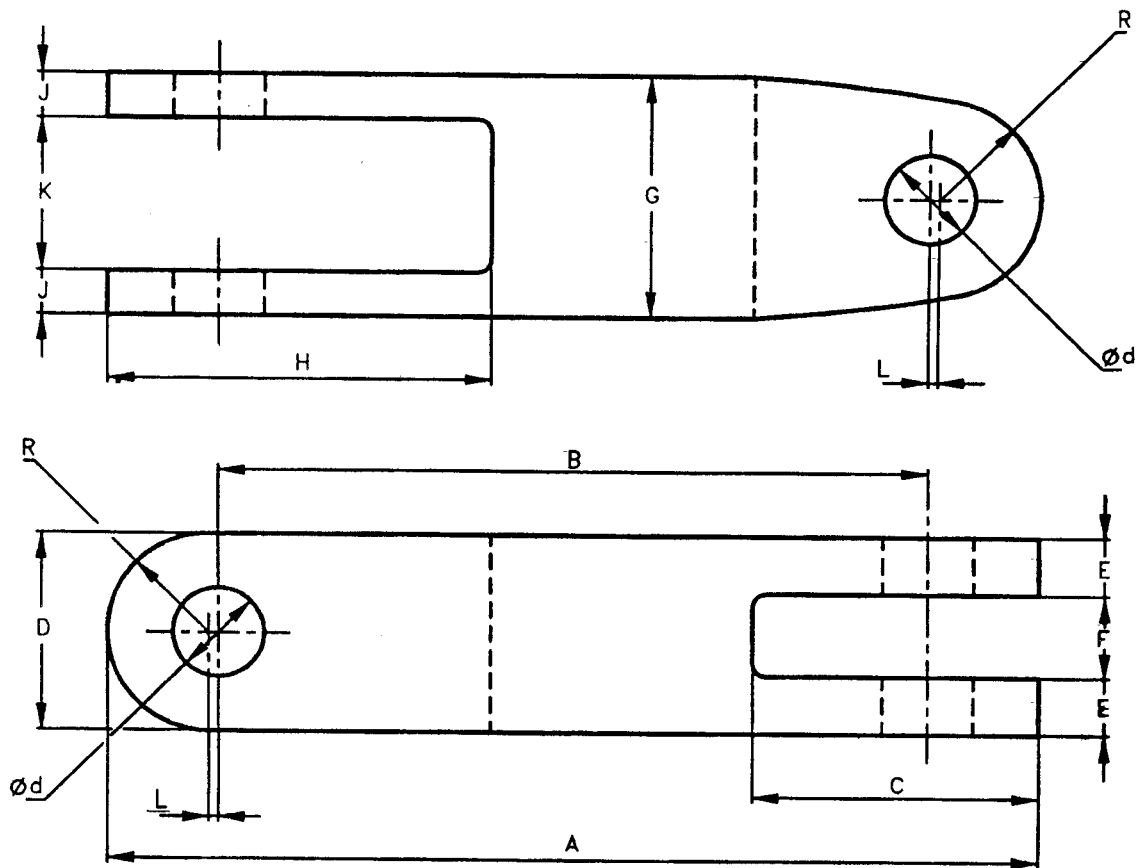


All dimensions in millimetres.

Safe Working Load	Hook Size	B	D	ϕE	F	G	H	J	K
kN	(A)								
120	254	708	1 531	60	127	480	101.5	395	185
150	254	731	1 589	75	136.5	490	105	395	195
200	305	860	1 765	80	152.5	593	115	490	235

4.3 Top Chase Block, Bottom Chase Block and Link Plate

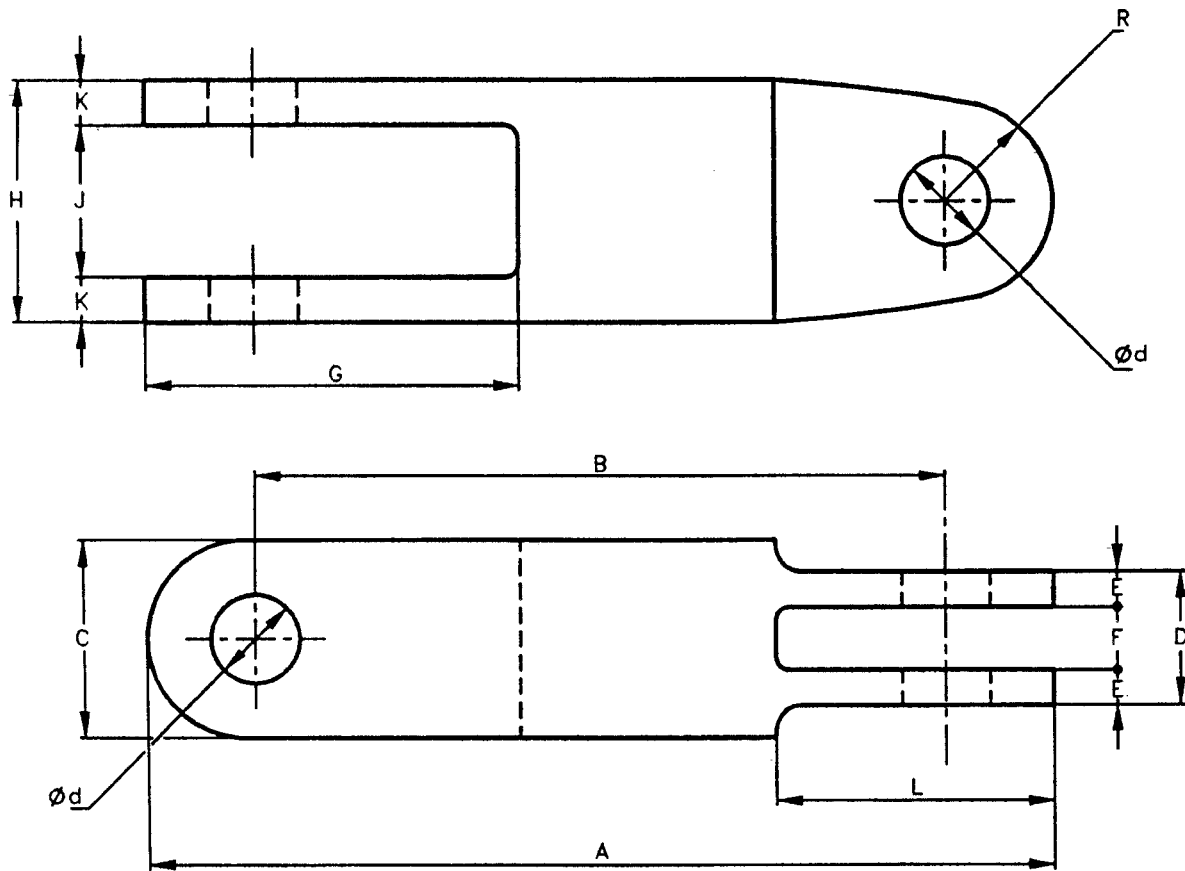
4.3.1 Top Chase Block



All dimensions in millimetres.

Safe Working Load kN	A	B	C	D	E	F	G	H	J	K	R	ϕd	L
120	625	455	211	145	42.5/36	60/73	180	240	37	106	77	60	6
150	650	458	220	150	38	74	220	250	44	132	90	75	6
200	685	473	245	180	50	80	252	310	48	156	100	80	6

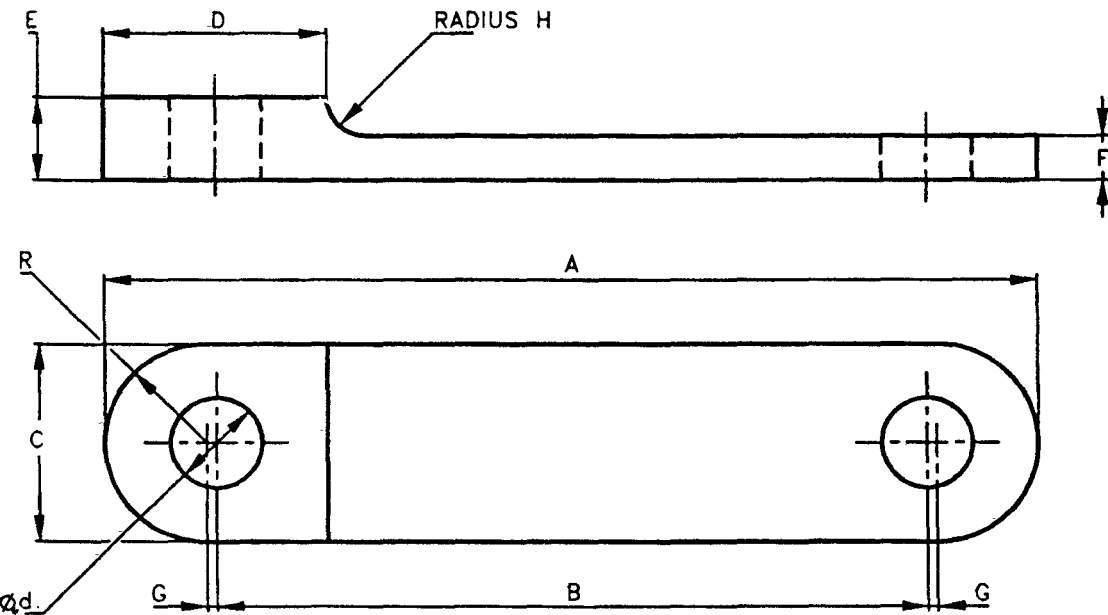
4.3.2 Bottom Chase Block



All dimensions in millimetres.

Safe Working Load kN	A	B	C	D	E	F	G	H	J	K	L	R	ϕd
120	490	320	174	98	26	46	205	174	106.5	34	220	85	60
150	542	362	200	112	30	52	210	200	132	34	225	90	75
200	640	450	250	176	48	80	310	250	154	48	260	110	80

4.3.3 Link Plate

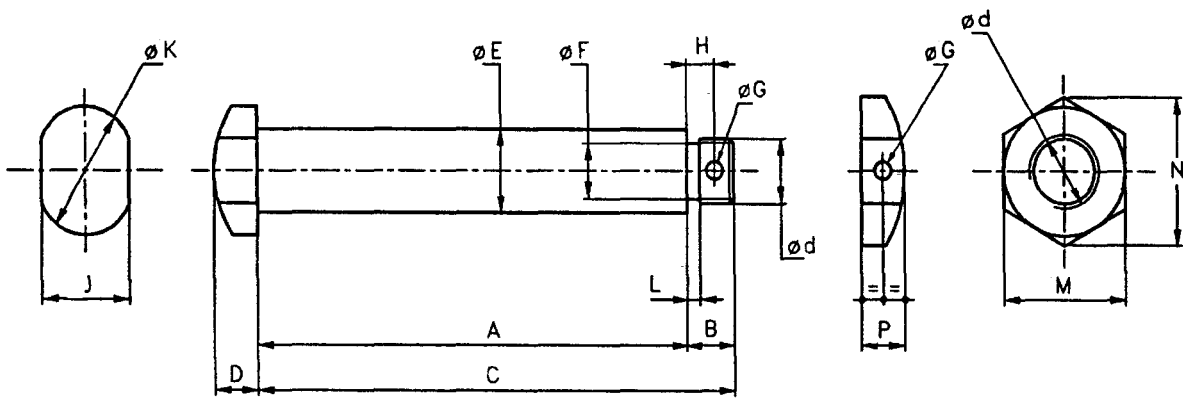


All dimensions in millimetres.

Safe Sorking Load	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	ϕd	<i>R</i>
kN										
120	504	356	136	146	62	41	6	27	60	68
150	580	388	175	202	84	44	6	27	75	90
200	632	420	190	215	87	48	6	27	80	100

4.4 Pin with Nuts for Top Chase Block, Bottom Chase Block, Bottom Link Plate, Centre Pin and Shearing Pin

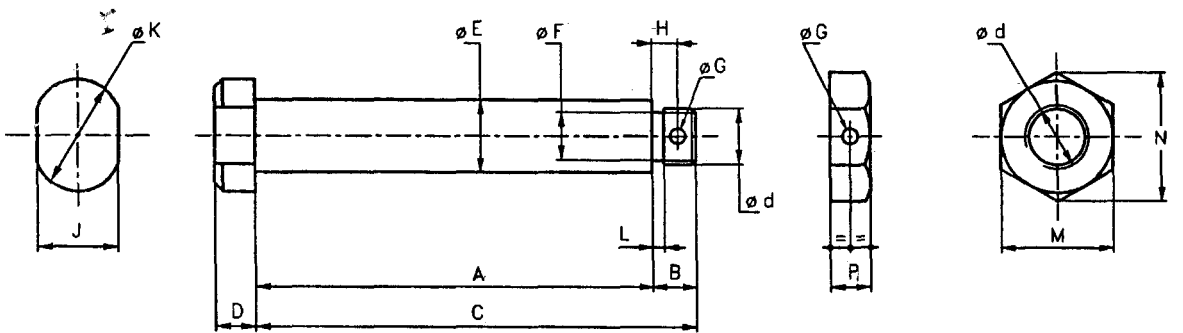
4.4.1 Pin with Nut for Top Chase Block



All dimensions in millimetres.

Safe Working Load kN	A	B	C	D	ϕd	ϕE	ϕF	ϕG	H	J	ϕK	L	M	N	P
120	180	30	210	30	56	60	52	8	15	75	85	3	75	85	30
150	220	35	255	35	71	75	67	8	17.5	85	95	3	85	95	35
200	252	26	278	26	76	80	72	8	13	95	105	3	95	105	26

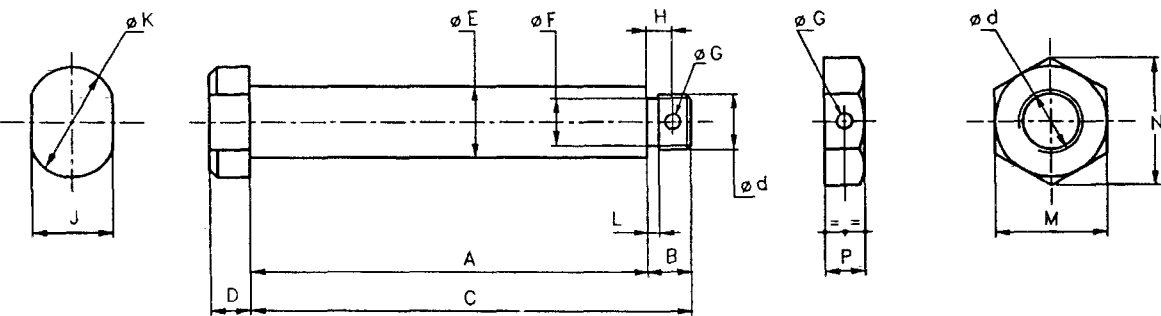
4.4.2 Pin with Nut for Bottom Chase Block



All dimensions in millimetres.

Safe Working Load kN	A	B	C	D	ϕd	ϕE	ϕF	ϕG	H	J	ϕK	L	M	N	P
120	174	30	204	30	56	60	52	8	15	75	85	3	75	85	30
150	200	32	232	32	71	75	67	8	16	85	95	3	85	95	32
200	250	35	285	35	76	80	72	8	17.5	95	105	3	95	105	35

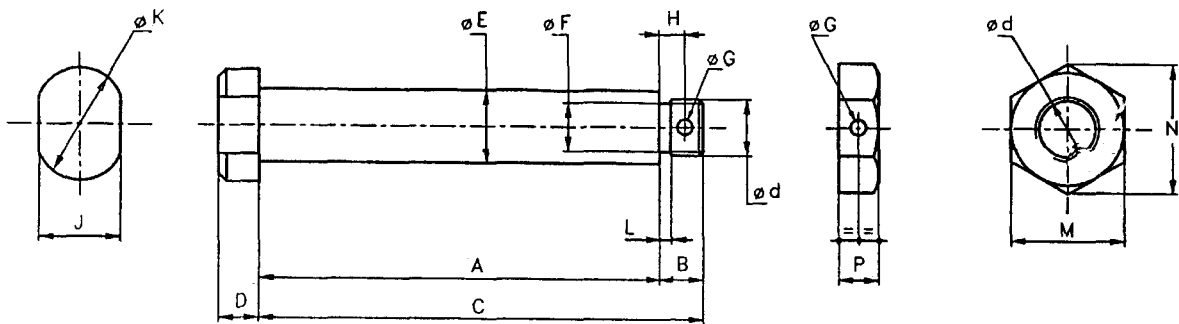
4.4.3 Pin with Nut for Bottom Link Plate



All dimensions in millimetres.

Safe Working Load	A	B	C	D	ϕd	ϕE	ϕF	ϕG	H	J	ϕK	L	M	N	P
kN															
120	190	30	220	30	56	60	52	8	15	75	85	3	75	85	30
150	222	32	254	32	71	75	67	8	16	85	95	3	85	95	32
200	254	35	289	35	76	80	72	8	17.5	95	105	3	95	105	35

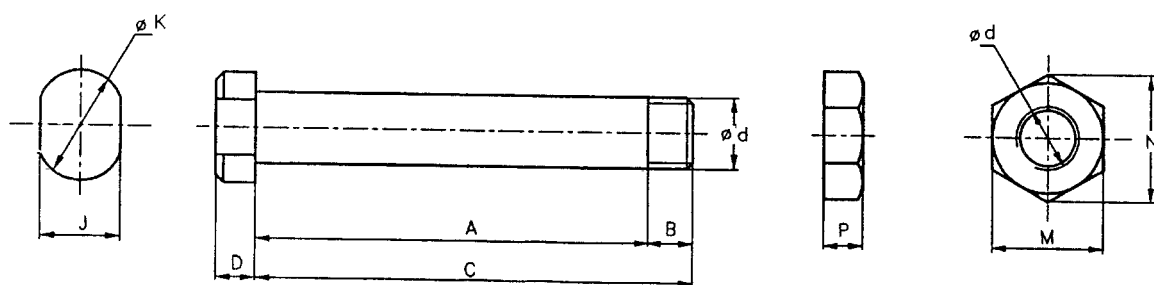
4.4.4 Centre Pin with Nut



All dimensions in millimetres.

Safe Working Load	A	B	C	D	ϕd	ϕE	ϕF	ϕG	H	J	ϕk	L	M	N	P
kN															
120	105	30	135	30	56	60	52	8	15	75	85	3	75	85	30
150	130	35	165	35	71	75	67	8	17.5	85	95	3	85	95	35
200	152	35	202	35	76	80	72	8	17.5	95	105	3	95	105	35

4.4.5 Shearing Pin with Nut

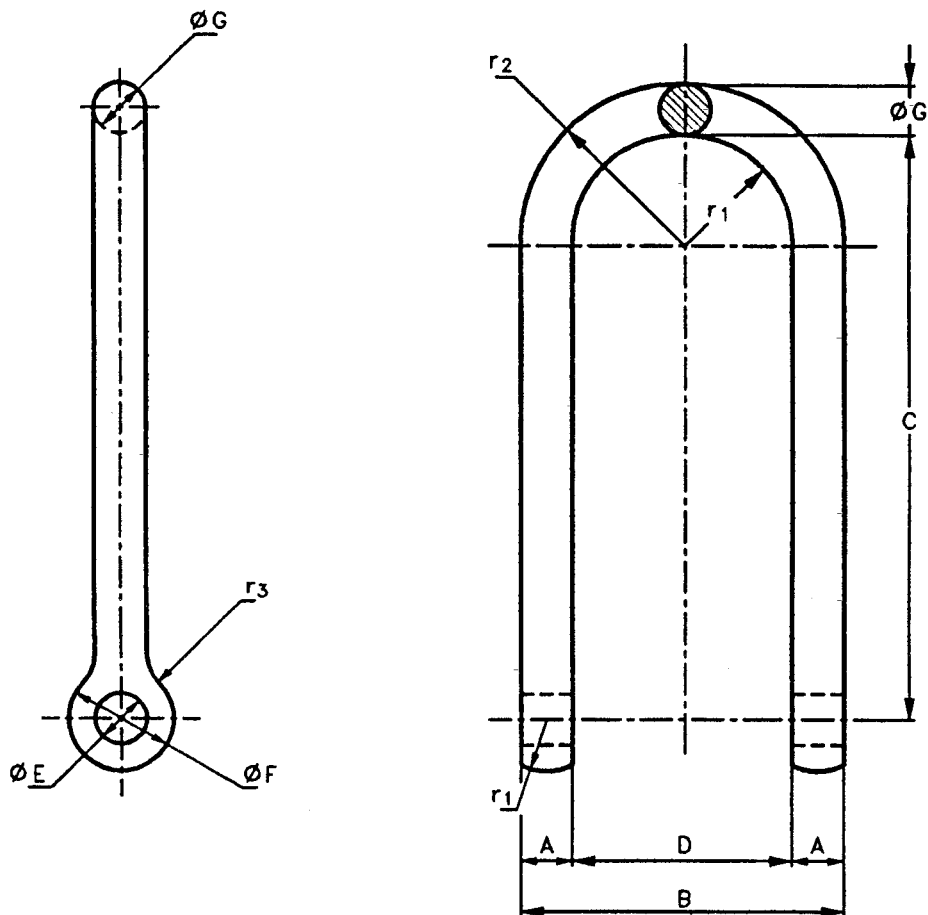


All dimensions in millimetres.

Safe Working Load	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	ϕd	ϕk	<i>J</i>	<i>M</i>	<i>N</i>	<i>P</i>
kN										
120	105	50	155	25	14	25	21	21	25	25
150	130	45	175	20	16	22	18	18	22	20
200	152	45	197	20	20	22	18	18	22	20

4.5 Lifting Shackle and Pin

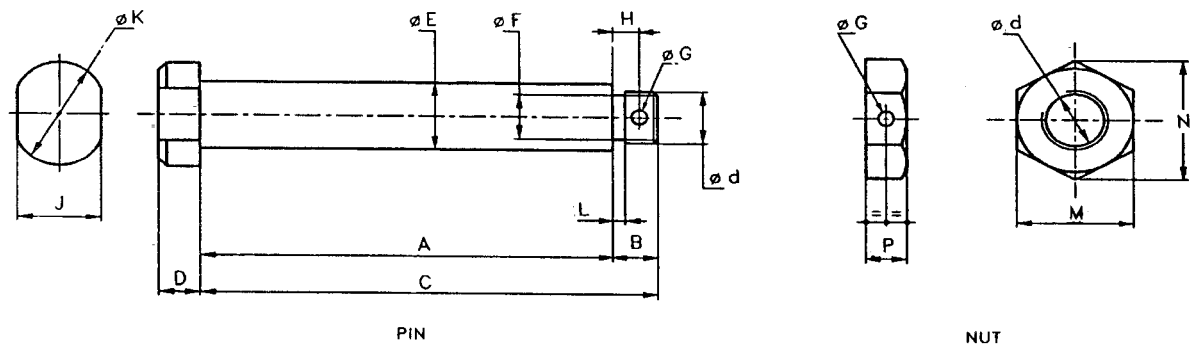
4.5.1 Lifting Shackle



All dimensions in millimetres.

Safe Working Load	A	B	C	D	ϕE	ϕF	ϕG	r_1	r_2	r_3
kN										
120	40	188	280	108	34.5	100	40	54	94	30
150	40	212	300	132	39	105	40	66	106	30
200	50	252	325	152	44.5	110	50	76	126	30

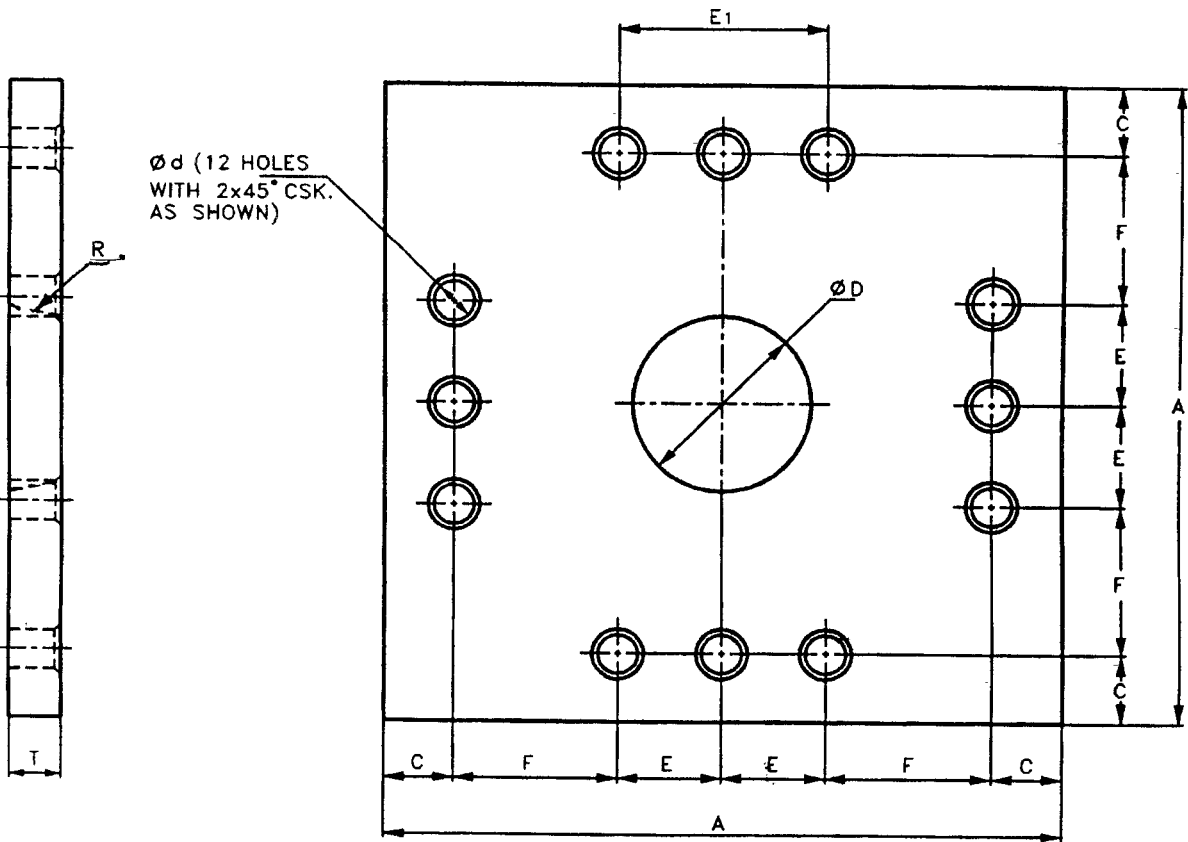
4.5.2 Pin with Nut



All dimensions in millimetres.

Safe Working Load kN	A	B	C	D	ϕd	ϕE	ϕF	ϕG	ϕK	H	J	L	M	N	P
120	188	25	213	20	30	34	25	6	65	12.5	55	3	60	70	25
150	212	20	232	15	35	38.5	30	6	70	10	60	3	65	75	20
200	252	25	277	20	40	44	35	6	75	12.5	65	3	70	80	25

4.6 Catch Plate



All dimensions in millimetres.

Safe Working Load kN	A	C	ϕD + 1.0 + 0.5	ϕd	E	E_1	F	R	T
120	756	50	248	33	222	444	106	33	35
150	756	50	258	33	222	444	106	33	40
200	756	50	313	33	222	444	106	33	63

5 MATERIAL

All components of safety detaching hook except spacer block rivet and shear pin shall conform to the material specified in IS 7587 (Part 1). The materials

for the spacer block rivets and shear pin shall conform to the undermentioned Indian Standards.

Spacer block rivets	Rivet bars conforming to IS 1148
Shear pin	Copper conforming to IS 191 (Parts 1 to 10)

6 DESIGNATION

A safety detaching hook of 200 kN safe working load manufactured from alloy steel shall be designated as :

Safety Detaching Hook 200 IS 7587 — A

NOTE—Letter 'M' shall be used to designate the hooks manufactured from 11Mn2 and 20 Mn2 steel and letter 'A' shall be used to designate the hooks manufactured from alloy steel.

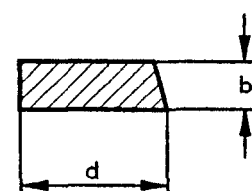
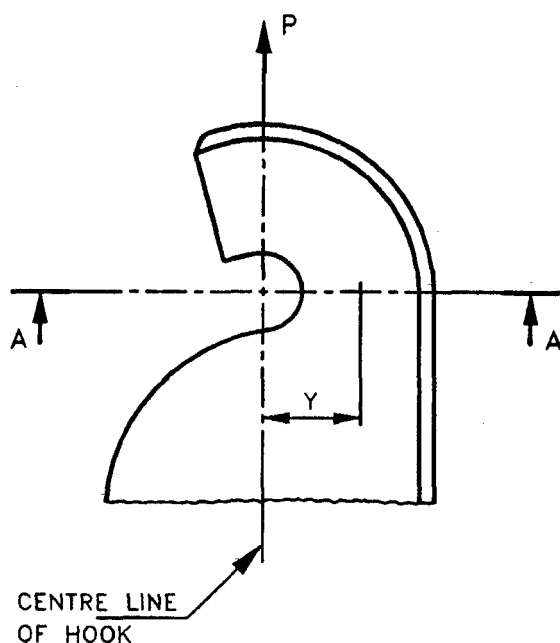
7 DESIGN

The hook plates shall be so designed that the ratio of d/b (see Fig. 1) is between 2.3 and 3.5 and the ratio of d/y is between 1.15 and 1.28.

8 GENERAL REQUIREMENTS

8.1 Hook Plates and Other Load Carrying Plates

8.1.1 Plates shall be fully machined on both sides to parallel dimensions with a surface roughness grade of N7 (see IS 3073) in the direction normal to the lay and shall be free from any warping, harmful nicks, burrs, deep machining or grinding marks. Plates shall



SECTION AA

FIG. 1 DIMENSIONS OF HOOK PLATE

be laid out so that the direction of service tensile stress corresponds to the grain direction for the material.

8.1.2 Detaching hooks shall be forged from ingot/billets/rolled plates of adequate thickness. A forging ratio of minimum 3:1 shall be ensured.

8.1.3 For inner plates, the profiling of the plates may be carried out by flame cutting during one of the intermediate stages of forging to ensure proper grain direction.

8.1.4 The final shaping of both inner and outer plates may be performed on a flame cutting machine provided that sufficient margin (at least 3 mm or 0.25 times the thickness or plate whichever is greater but not more than 15 mm) is allowed for removal by machining or grinding of any surface marks which may be created as a result of flame cutting operation. If flame cutting is adopted for profiling of the hooks, it is recommended that the inside throat of the 4 hook plate be drilled $4d$ instead of flame cut.

NOTE — In kings type safety hook, the outer plates do not take the load but in humble type safety hook outer plates do take the load hence outer plates should be made from forging.

8.1.5 Plates shall not be welded.

8.1.6 Through holes in plates shall be machined to provide true alignment with matching components in the assembly.

8.1.7 Holes shall be accurately reamed to their basic sizes.

8.1.8 Prior to final machining and after any profiling, the plates shall be normalized or hardened and tempered within the temperature range appropriate to the material.

8.1.9 The length of the centering pin shall be at least 0.5 mm more than the calculated total width of the plates of the hooks. It shall also be ensured that during the assembly of the detaching hook, the face of the center pin/ nut does not touch the face of the plates of the detaching hook.

9 HEAT TREATMENT

Heat treatment shall be in accordance with 8 of IS 7587 (Part 6).

10 TESTING

10.1 Prototype Test

Notwithstanding with any provision for statutory requirements, prototype of the component shall be tested to destruction to ensure the minimum factor of safety of ten in the component. The above test shall be made in a test house approved by the appropriate authority permitting the use of suspension arrangement.

10.1.1 One piece out of every hundred pieces manufactured by a manufacturer shall be identified by a suitable mark enabling the piece to be put to destructive test so that the factor of safety of individual component of the detaching hook can be reascertained.

10.2 Detaching Test

Each detaching hook shall be attached to its corresponding correct size of chase block/ link plates at each end. The detaching hook shall then be loaded with full normal safe working load applied in tension and pulled vertically through a catch plate of the correct size and shape for the hook being tested. The detaching hook shall function correctly, detaching from the upper attachment pin and become securely engaged in the catch plate.

10.3 Proof Load Test

After completion of detaching test (*see 10.2*) each assembled safety hook complete with top and bottom chase block/link plates but with fresh shearing pin shall be subjected to tensile proof load of three times to that of safe working load and shall satisfactorily withstand the test without any permanent deformation or defect.

10.3.1 Each component shall be separately and thoroughly examined for cracks after proof load test, visually and by means of other suitable devices and shall be found free from defects which could adversely affect the function of mechanical properties of the detaching hook. Magnetic crack detection test shall be carried out on each set and ultrasonic test shall be conducted if required.

10.3.1.1 The acceptance level of flaws detected during testing by magnetic particle flaw detection method is given in Annex A.

11 MARKING

11.1 Identification Marking

Each plate of the safety hook shall be permanently and legibly stamped on non-wearable portion with the manufacturer's identification mark, safe working load, date of manufacturing, serial number and the abbreviated name and material.

NOTE — Symbol 'M' shall be employed for 11 Mn2 and 20 Mn2 steel and symbol 'A' for 20Ni 55Cr50Mo20 steel.

11.2 The stamps to be used for marking shall be such that the size of lettering of the mark is at least 8 mm.

11.3 Inspection Marking

When the test results are found to be satisfactory the representative of testing laboratory shall immediately stamp the inspection mark on the components.

11.3.1 BIS Certification Marking

The safety detaching hooks may be marked with the Standard Mark.

11.3.1.1 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

12 PAINTING, PACKING AND SUPPLY

Painting, packing and supply shall be in accordance with 11 of IS 7587 (Part 6).

13 CERTIFICATE OF TEST

A certificate of test in triplicate in accordance with 12 of IS 7587 (Part 6) shall be furnished by the manufacturer to the purchaser.

ANNEX A
(Clause 10.3.1.1)

PERMISSIBLE IMPERFECTIONS FOR MAGNETIC PARTICLE INSPECTION

A-1 Magnetic particle flaw detection shall be carried out as per IS 3703. The type of defects and their limits are given in A-2, A-3 and A-4.

A-2 Imperfections in components may be in the form of:

- a) Non-metallic inclusions which are inherent in steels, and
- b) Cracks.

NOTE—Magnetic particle inspection will reveal these imperfections when they are on or just below the surface.

A-3 A longitudinal imperfection is one which generally runs parallel to the major dimension of the

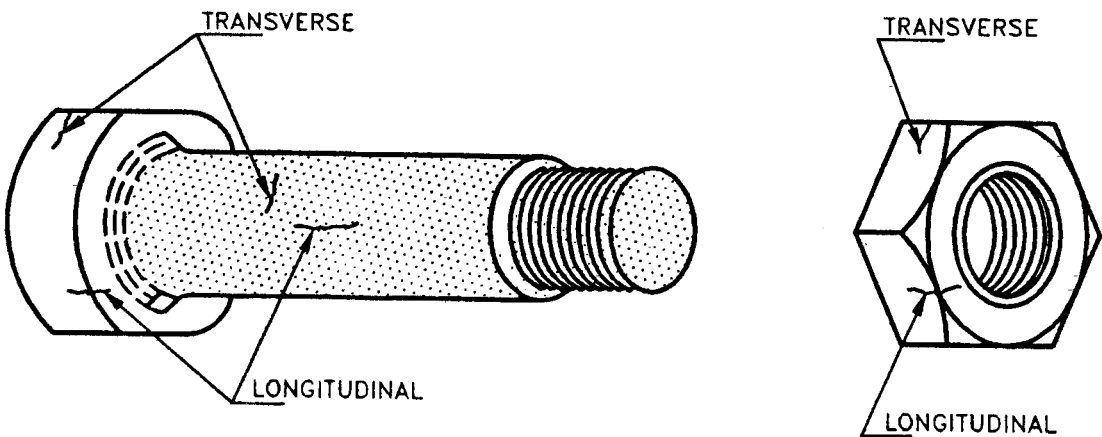
component. A transverse imperfection is one which runs at right angles to the line defined for a longitudinal imperfection.

A-4 LIMITS OF PERMISSIBLE IMPERFECTIONS

Tables given under Fig. 2 to 4 show the limits of permissible inclusions. Cracks shall not be permitted.

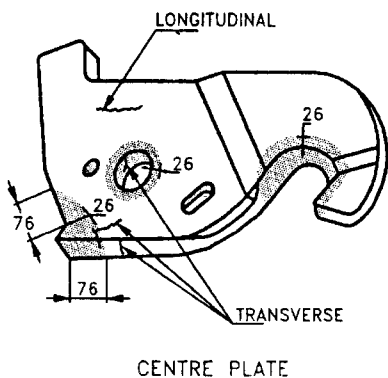
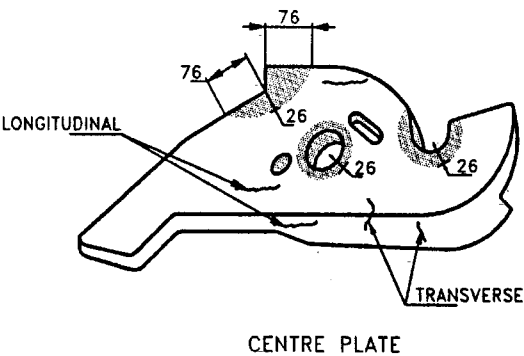
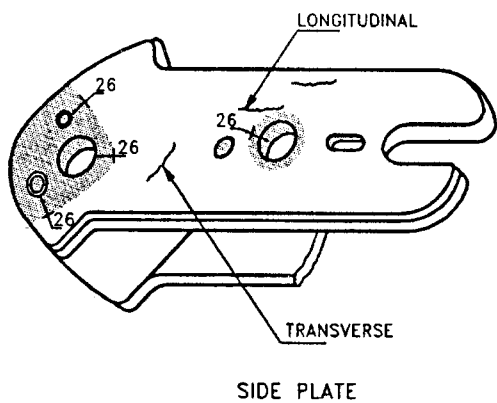
A-5 RECORD

Imperfection which, although within the permissible limits, are of a large number, unusual pattern or direction, should be recorded on the component certificate.



Part	Type of Imperfection	Permissible Imperfections
Shaded Areas		
Pin Barrel and Thread	Transverse	None
	Longitudinal	None > 32 mm
Unshaded Areas		
PIN Head and Nut	Transverse	None > 10 mm
	Longitudinal	None > 10 mm

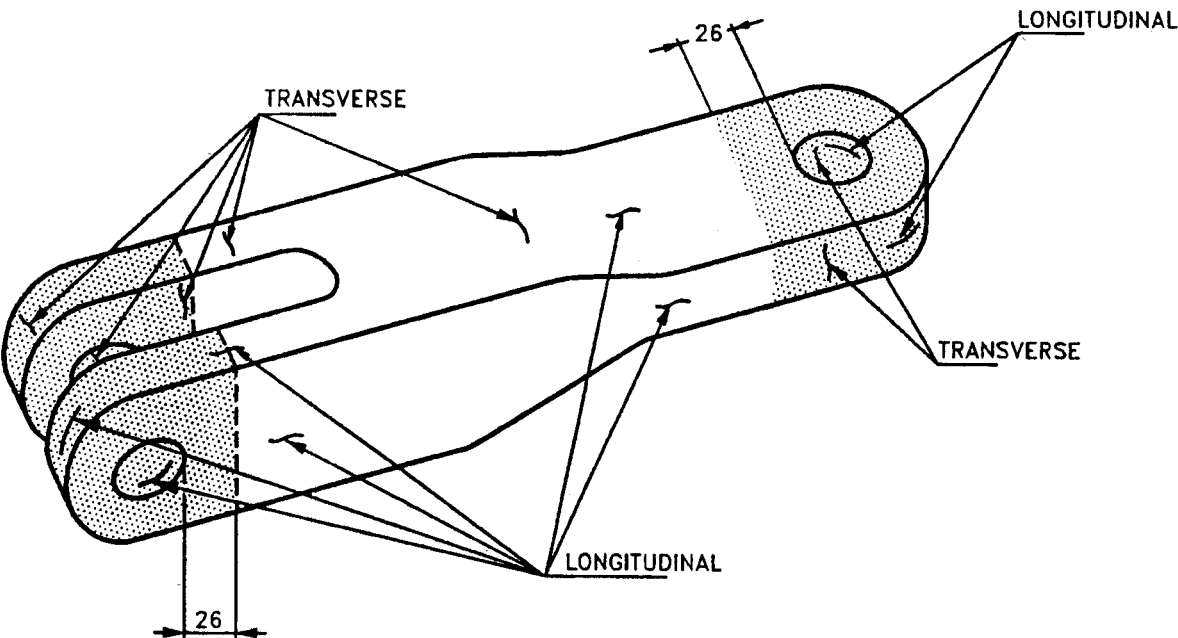
FIG. 2 PIN AND NUT



Part	Type of Imperfection	Permissible Imperfections
Shaded Areas		
Plate Surfaces	Transverse	None
	Longitudinal	None > 10 mm
Plate Edges	Transverse	None
	Longitudinal	None > 32 mm
Holes and Slots	Transverse	None
	Longitudinal	None > 16 mm
Unshaded Areas		
Plate Surfaces and Slots	Transverse	None
	Longitudinal	None > 32 mm
Plate Edges	Transverse	None
	Longitudinal	None > 64 mm

All dimensions in millimetres.

FIG. 3 SAFETY HOOK



Part	Type of Imperfection	Permissible Imperfections
Shaded Areas		
Surfaces	Transverse	None
	Longitudinal	None > 10 mm
Holes and Edges	Transverse	None
	Longitudinal	None > 16 mm
Unshaded Areas		
Body and Edges	Transverse	None
	Longitudinal	None > 32 mm

All dimensions in millimetres.

FIG. 4 LINK MEMBERS

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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